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WinProbe Version 1.0
Firmware: TFW 1.0

Date: 7/20/2004

1.0 介绍

WinProbe 是 Probe12™ 的图形用户界面，以 TDP 为基础的茎流系统。Probe12 有两种版本。

Probe12-IS - 闭路灌溉调度器和数据采集器版本。
Probe12-DL - 只有数据采集器的版本。

WinProbe 以 Dynamax's **Flow4 version 6.0 为基础。 所以，FLOW4 的**通讯，水分收支计算和灌溉调度等功能都适合 WinProbe。Probe12 接受 TDP 传感器输出并且最多可以读取 12 个 TDP30 传感器。

本手册讨论 TDP 传感器设置和 WinProbe 和 Probe12 的检测功能。关于数据采集器，灌溉调度，通讯，系统维护的详细讨论，请参考 Flow4 Version 6.0 手册。.

TDP 传感器的安装，技术规格和维护，参考 Thermal Dissipation Probe 手册。

2.0 软件安装

2.1 利用 WinProbe CD 安装软件

系统需求：
WinProbe 软件 version 1.0 要求

1. PC 系统运行最低需要 Windows 95，以及
2. 最少 3MB RAM 和 5MB 硬盘空间。
3. WinProbe 是 windows 软件，需要 Windows95 或后期版本
4. 9 pin COM1 或 COM2 端口，串行输入。

WinProbe 软件 CD 随系统一起提供。CD 包含了 WinProbe 软件设置文件；历史记录，数据采集器的示例数据文件；默认的 WinProbe 设置信息。设置文件提供了安装 WinProbe 软件的逐步程序。安装下面给出的步骤在电脑上安装软件。

Before starting the installation process make sure you have the software serial number provided by Dynamax. A serial number is required in order to install the software so have the serial number documented. Insert WinProbe software CD provided along with the WinProbe in CD Drive Select CD Drive in the explorer window, open the directory WinProbe V6.0 CD to view the setup files Click on Setup.exe to initiate the installation wizard that will guide you through the installation steps. At the prompt enter the 14-character software serial number provided by Dynamax WinProbe executable along with setup and data examples will be installed in directory "C:\\Dynamax\WinProbe\". This location can be changed during the installation process on Choose destination Location panel. After installation a short cut will be placed on the desktop as well as on the Start menu.

2.2 Verify the Installation

Verify the installation process by doing the following steps,

Open the directory "C:\\Dynamax\WinProbe\" the directory or. Path specified in the Change destination location dialog box during installation. Make sure you find the WinProbe executable

icon. Verify the shortcut WinProbe V6.0 on the windows start menu programs. Also verify for proper installation in the Control Panel, click on the Add/Remover programs which opens a dialog box as shown in the fig. 7.1 , scroll down to find the WinProbe executable.

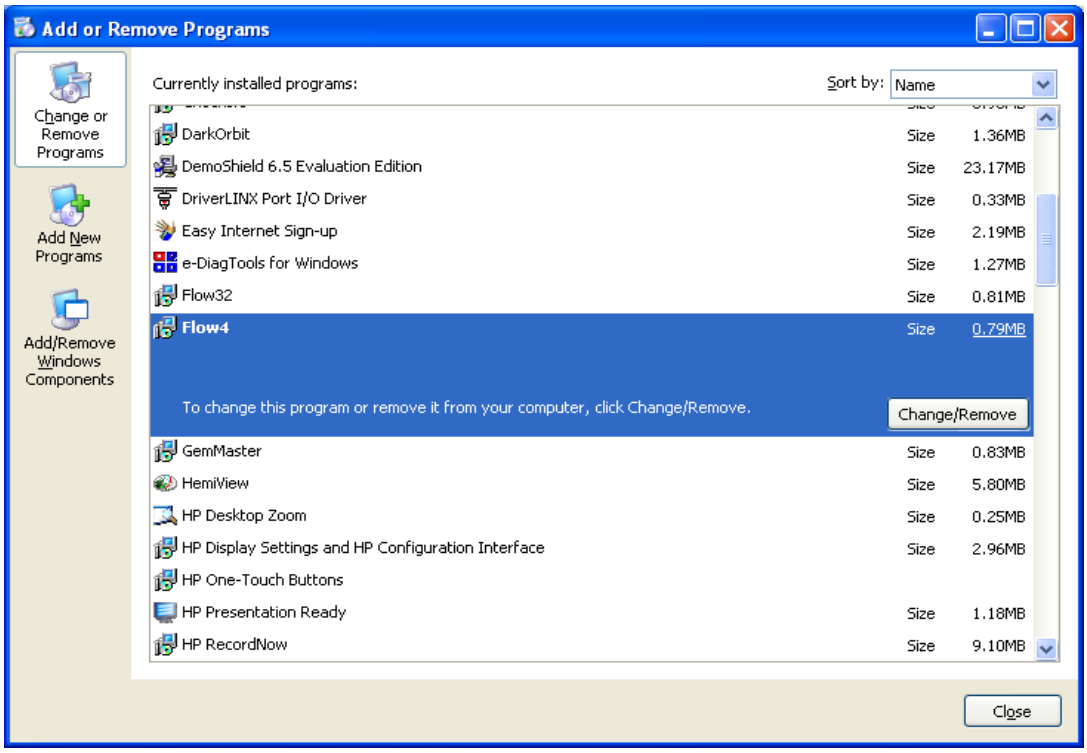

Add or Remove Programs
Change or Remove Programs
Add New Programs
Add/Remove Windows Components
Currently installed programs:
Sort by: Name
DarkOrbit Size 1.36MB
DemoShield 6.5 Evaluation Edition Size 23.17MB
DriverLINX Port I/O Driver Size 0.33MB
Easy Internet Sign-up Size 2.19MB
e-DiagTools for Windows Size 1.27MB
Flow32 Size 0.81MB
Flow4 Size 0.79MB
To change this program or remove it from your computer, click Change/Remove.
Change/Remove
GemMaster Size 0.83MB
HemiView Size 5.80MB
HP Desktop Zoom Size 0.25MB
HP Display Settings and HP Configuration Interface Size 2.96MB
HP One-Touch Buttons
HP Presentation Ready Size 1.18MB
HP RecordNow Size 9.10MB
Close

Figure 2.1 WinProbe Installation

2.3 Uninstall / Modify WinProbe

In order to install or upgrade the software with new version click on the setup icon,

to open the install shield wizard dialog as shown in the fig. 7.2. In the popup dialog box select REMOVE or MODIFY. The Install shield wizard will walk you through the Uninstall steps. Do not delete the software executable directly as it might corrupt the system windows system files.

InstallShield Wizard
Welcome
Modify, repair, or remove the program.
Welcome to the Flow4 Setup Maintenance program. This program lets you modify the current installation. Click one of the options below.
Modify
Select new program components to add or select currently installed components to remove.
Repair
Reinstall all program components installed by the previous setup.
Remove
Remove all installed components.
InstallShield
< Back
Next >
Cancel

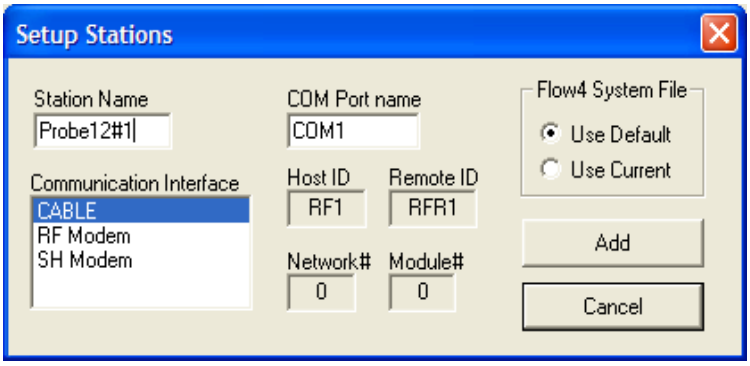
In the Welcome dialog select the appropriate action, Select Modify, for upgrading the software installed in the hard drive Select Remove to uninstall the software completely from the hard drive Alternatively user the Change/Remove button next to WinProbe on the Add/Remove programs dialog box of the control panel.

Figure 2.2 WinProbe Installation

3.0 WinProbe Stations Configuration

Click on **System Tab >> Add Station** to open Setup stations dialog box. Default selections are made in the dialog, change the parameters as required,

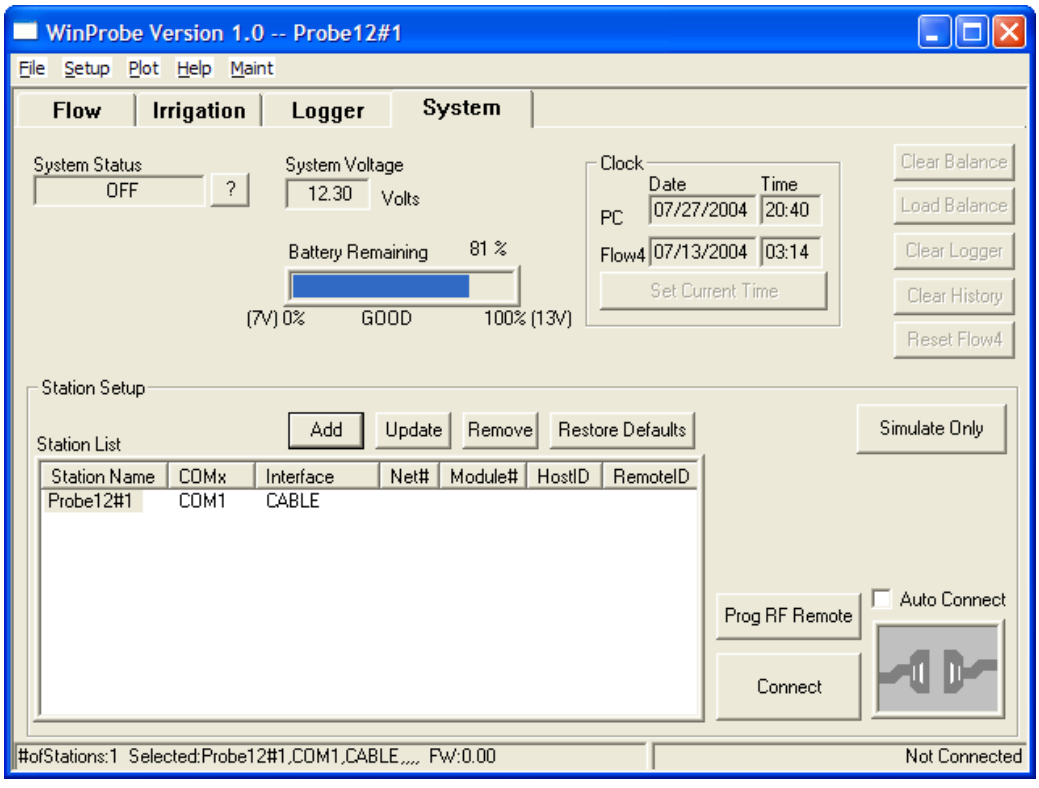
- Station name
- COM port name
- Interface type
- HostID
- RemoteID
- Network#
- Module#
- System file radio button



Select OK to add the station. This will close the dialog box and new station appears in the station list box in System Tab as shown in the figure below..

To connect a station, select station name from the list, click on command button **Connect.** If required program RF remote before hardware setup. Once connection is established to logger/ Flow4 check the difference in clock between PC and Flow4. If the two clocks display a different time click on command button **Set Current Time.**

Now that connection and time are set, all the data from Flow4 are on a real-time/ local time. Flow4 6.0 updates continuously with the current data from the Flow4 station.



4.0 Flow Screen

Click on **Flow Tab** to display Flow screen shown in the figure 3.1. Flow screen contains Probe12 system setup, TDP sensor setup, Probe/Thermocouple report, and Plant-sap flow report. Click on the respective icon to view/modify the settings.

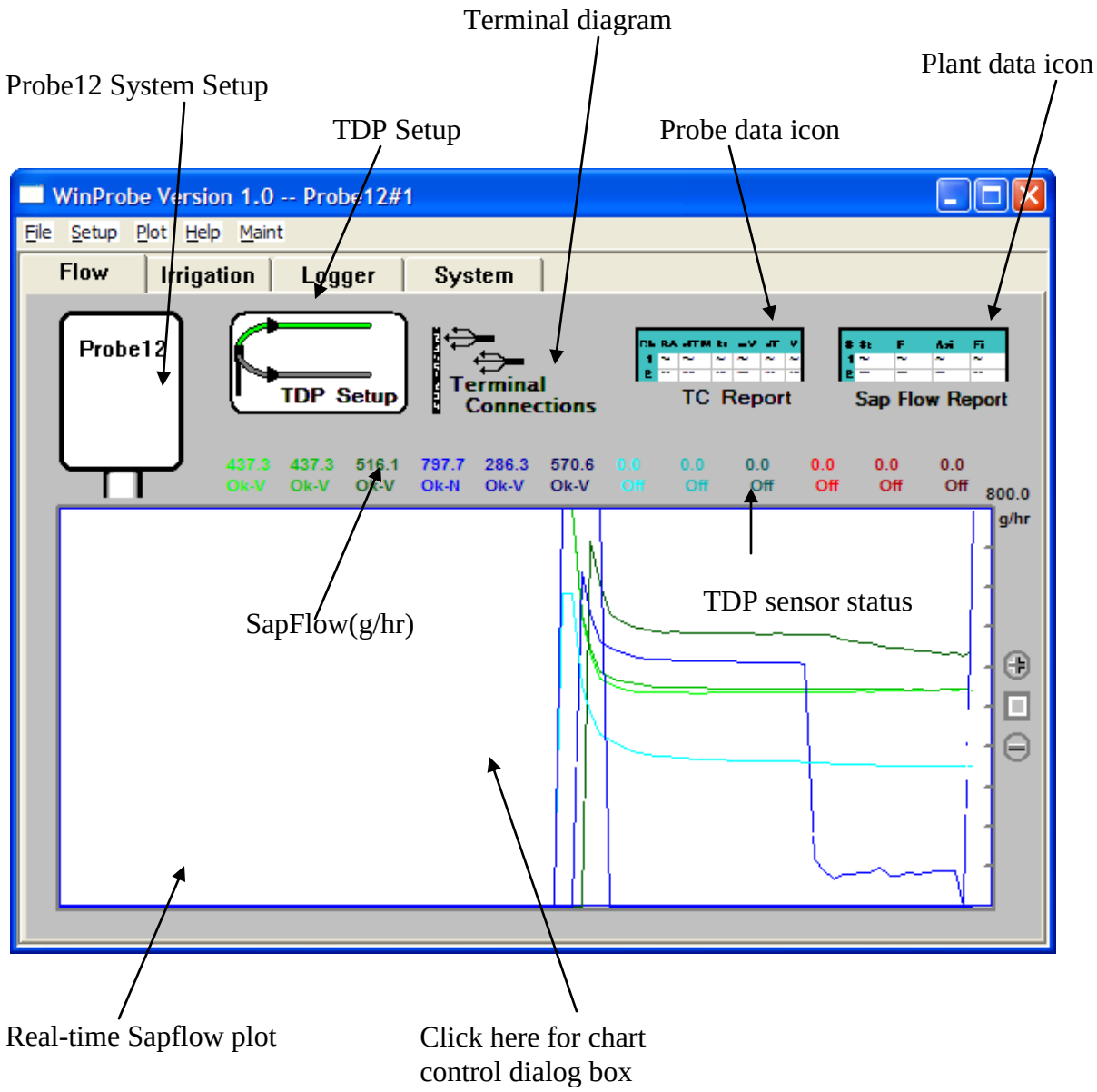
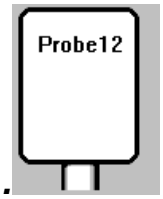
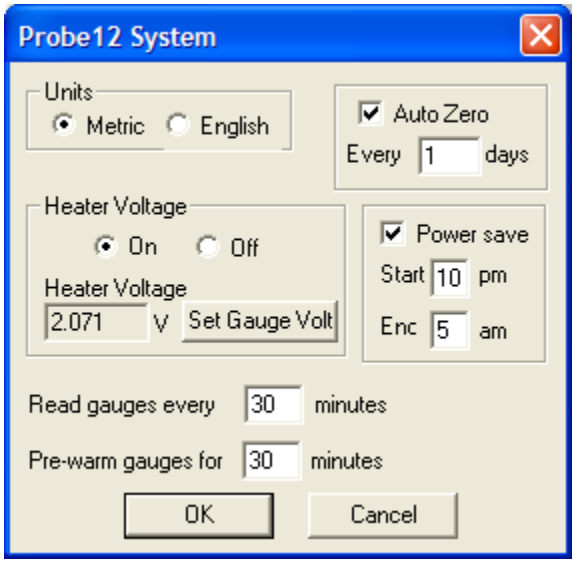


Figure 3.1 Flow Screen



4.1 Probe12 System Dialog……

Click on Probe12 icon to open Probe12 System setup dialog shown below. Setup parameters required for Probe12 system are explained below. Enter values in the appropriate boxes and click OK to confirm settings.



Click on Flow4 icon to open Flow4 system dialog box. The pop up dialog box is shown in the fig. 12.2. The following information is required to setup a Flow4 system.

Units
Select the system of units the input variables are assigned and results are required. Choose Metric for cm, gm etc or English for foot, pound etc. All scientific units such as Watts, Volts, and Ohms etc. are an exception to this choice.

Heater Voltage
This says whether heater voltage to the dynagage is applied or not. When Gage Heat is ON, voltage controlled by potentiometer is applied to the Dynagages. By selecting Gage Heat OFF the voltage applied to the dynagage heater is zero, in other words the gages are OFF and no valid data is obtained from the sap flow sensors.

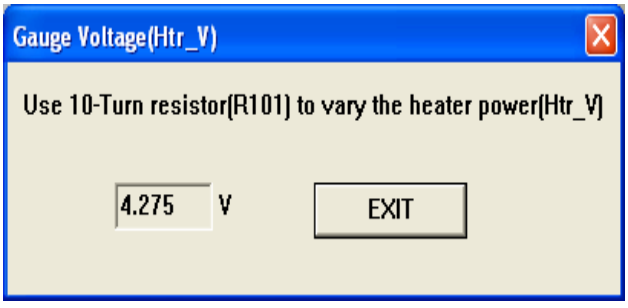


Figure 3.2 Heater Voltage Dialog box

Heater Voltage
Displays current heater voltage

Set Heater Voltage to TDP Sensors
Heater voltage in Volts applied to the dynagage heater coils. This can be measured from test point #TP4. To change the heater voltage, press the command button **Set Gage Volt** that pops up gage voltage dialog box shown in fig. 12.15. Now heater voltage to the dynagage can be adjusted turning the potentiometer knob "**Heater Voltage**" on the control panel of the Flow4. The continuous change in voltage is displayed on the gage voltage dialog box. Click EXIT to close the gage voltage dialog box. The new value of heater voltage is displayed next to the gage voltage. Refer to the heater input voltage table for maximum, minimum and typical values of voltages.

TDP type/Size	Power rating	Heater Resistance	Recommended Heater voltage
TDP10	0.08 – 0.12 W	26 Ohms	2V
TDP30	0.15 – 0.2 W	50 Ohms	3V
TDP50	0.32W	78 Ohms	5V
TDP80	0.5W	110 Ohms	7.5V
TDP100	0.44W	145 Ohms	8V

Table 3.1 Recommended heater input voltage

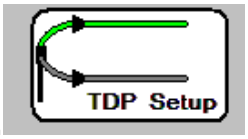
Read gauges Every
Displays the interval in minutes at which gages are scanned. The minimum interval is 1 minute and it is recommended the scan interval be 30 minutes or 60 minutes.

Pre-warm gauges for
This is the warm-up period for the gages during which heater voltage is applied and no zero/ksh set is performed. Warm-up time of 30 minutes is recommended.

Auto Zero
In order to perform auto zero and set new dTM value, check the control box and enter the interval (in multiples of days) in the text box. When selected Probe12 system performs auto zero between 2AM and 5AM and over writes the dTM value for each sensor with running average of the calculated dT.

Power Save
This is an optional feature and recommended that sap flow monitoring be turned off during night times when the flow rates are very low. Text boxes next to Start and Stop display power save mode. During power save mode heater voltage to the TDP is zero. External sensors are monitored during power save. The system will not perform the zero set during this time. If auto zero is chosen, it will over ride the power save.

4.2 TDP Setup Dialog……



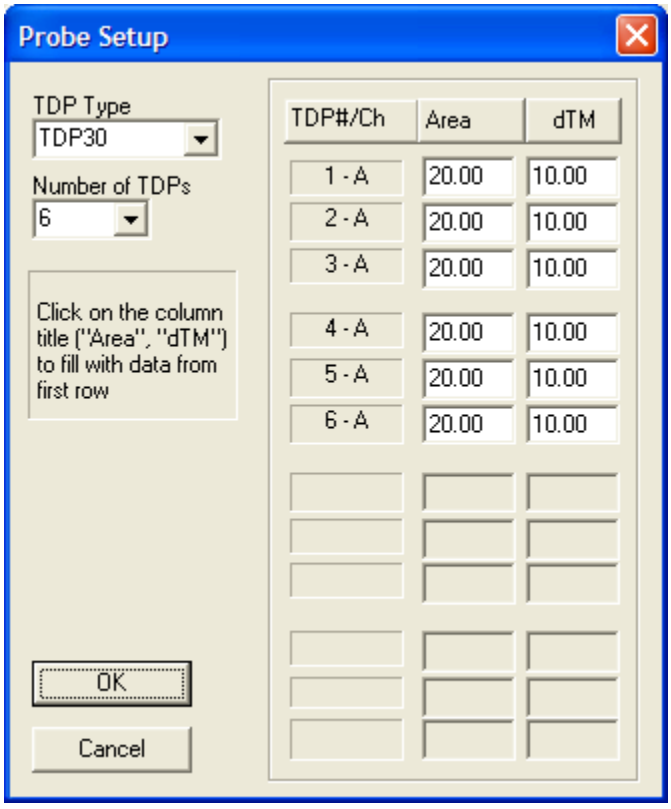
Click on TDP setup icon to open TDP setup dialog shown below.

Select TDP type from the drop down list of,

TDP 10
TDP 30
TDP 50
TDP 80
TDP 100

Select number of TDP sensors connected from the drop down list Number of TDPs

In the figure below TDP30 and 6 TDP sensors are selected.

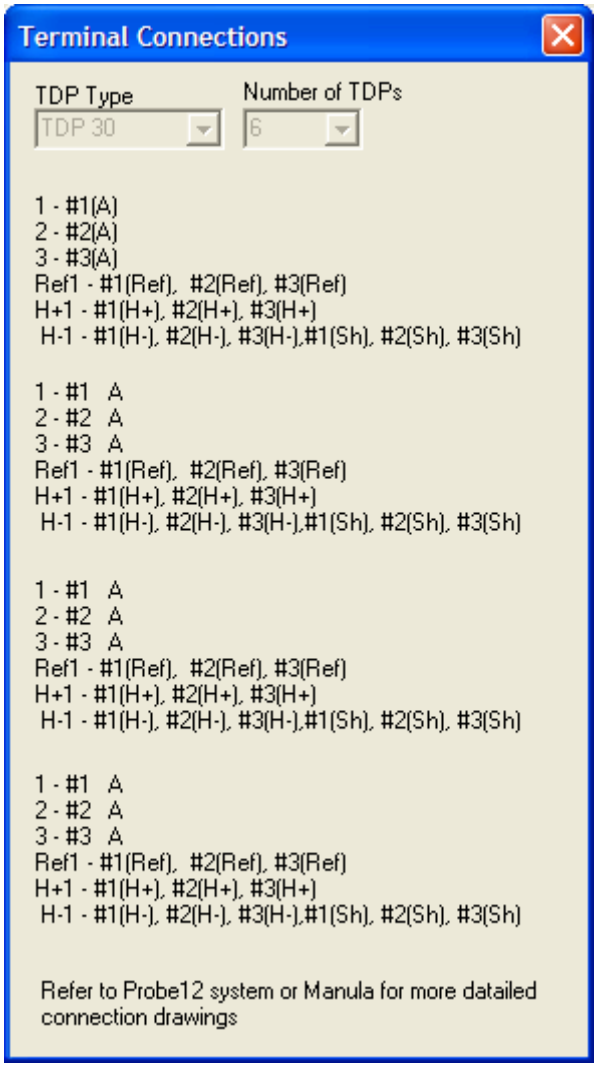


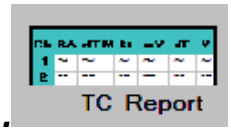
Enter Sapwood area in sq.cm for each TDP sensor or probe. In the demonstration Sapwood area= 20 cm^2 Enter dTM in deg.C default or starting value for each TDP sensor or probe. In the demonstration above dTM=10 deg. C

**** Refer to TDP User manual on determining Sapwood area.**

4.3 Terminal Connections……..

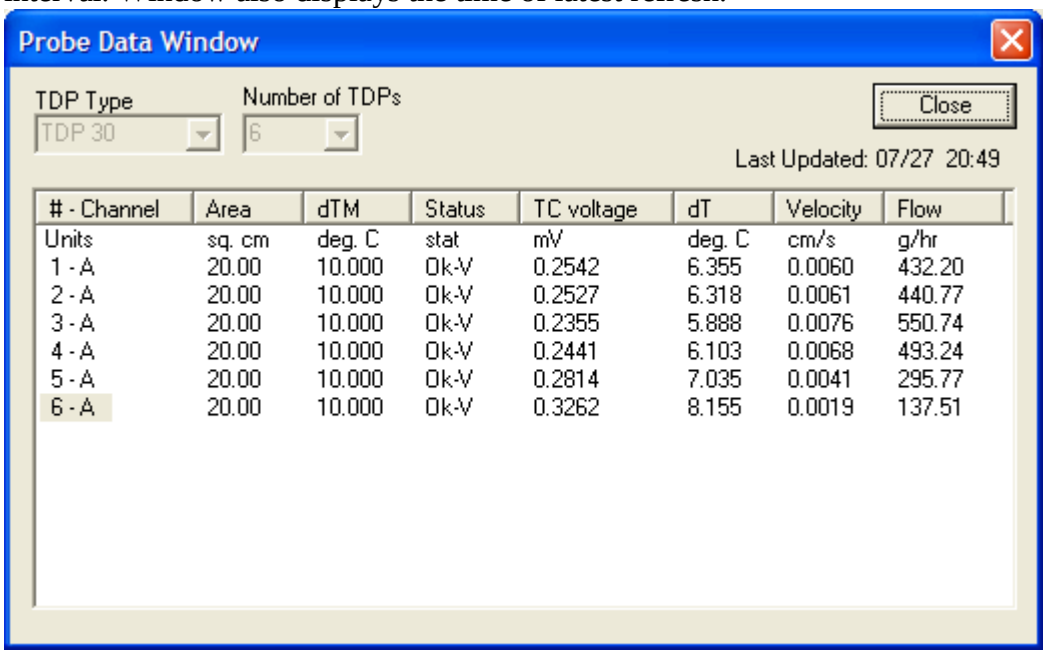
Terminal connections dialog displays terminal wiring for TDP type and number selected in TDP SEUP dialog box. A default wiring using 8’ cables for TDP 10/30/50 is assembled. Refer to the terminal connections dialog for additional sensor types Click on Terminal Connections icon to open the dialog. Shown in the figure below.





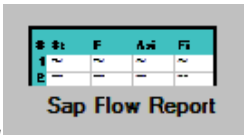
*4.4 P*robe Data Dialog .....

Probe data dialog displays real-time thermocouple voltage in mV and corresponding sapflow calculations, Thermocouple status along with sapwood area and dTM. Definition of status and possible remedy are given in the table below. A demonstration window is shown in figure below. Click on **TC Report** icon to open this window. Data in this window is updated every scan interval. Window also displays the time of latest refresh.



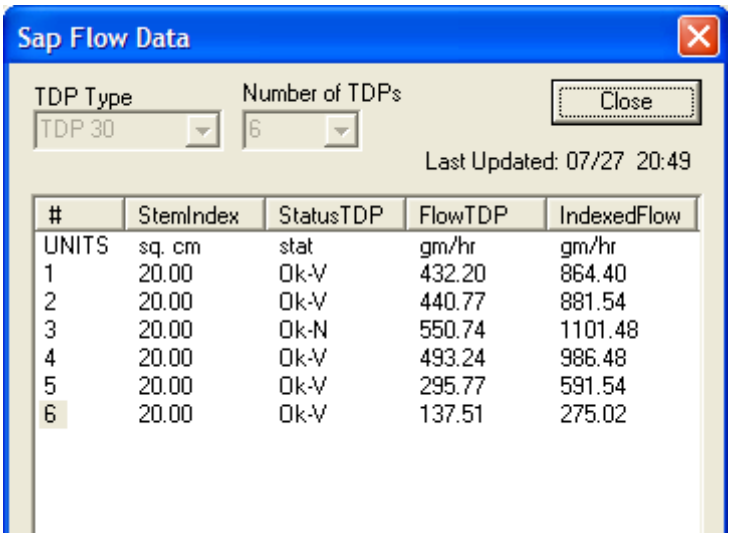
# - Channel	Area	dTM	Status	TC voltage	dT	Velocity	Flow
Units	sq. cm	deg. C	stat	mV	deg. C	cm/s	g/hr
1 - A	20.00	10.000	Ok-V	0.2542	6.355	0.0060	432.20
2 - A	20.00	10.000	Ok-V	0.2527	6.318	0.0061	440.77
3 - A	20.00	10.000	Ok-V	0.2355	5.888	0.0076	550.74
4 - A	20.00	10.000	Ok-V	0.2441	6.103	0.0068	493.24
5 - A	20.00	10.000	Ok-V	0.2814	7.035	0.0041	295.77
6 - A	20.00	10.000	Ok-V	0.3262	8.155	0.0019	137.51

Status display displayed on the gauge icon	**Gage Status** Dynagage status	**Description** Description of the status and remedy
Ok-V	VOTING	Data from the Thermocouple is valid.
Warm	WARMUP	Sensor is in the pre-warm up period, during this time no auto-zero is performed. Sap flow set to zero during this time usually 60min is required.
Fault	FAULTED	Sensor is either not connected properly or requires maintenance. Loose cables or connectors can also cause a fault.
Err	MATH ERROR	Represents an overflow in the sap flow computation of thermocouple data.
Max	MAX FLOW	Maximum flow indicates that temperature rise is too low, less than 1 deg-C at high flow rates. Calculated flow is over the maximum usable sensor capability.
Off	OFF	Sensor cable is OFF or is not connected. Also a bad connection in the heater wiring causes the off status



4.5 Sap Flow Data Dialog ……..……...

Click on **Sap Flow Report** icon to open **Sap Flow data Dialog**. Sap Flow data dialog displays real-time sap flow of each TDP, sap flow indexed to the field and TDP status. Definition of status and possible remedy are given in the table below. Data in this window is updated every scan interval. Window also displays the time of latest refresh.

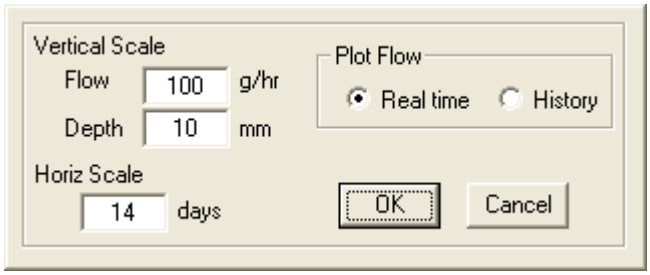


Status display displayed on the gauge icon	**Gage Status** Dynagage status	**Description** Description of the status and remedy
Ok-V	VOTING	Data from the TDP sensor is valid and is considered in calculating average sapflow or accumulate flow.
Ok-N	NOT VOTING	Data from the TDP sensor is valid but is voted out.
Warm	WARMUP	TDP is in the pre-warm up period, during this time no auto-zero is performed. Sap flow set to zero during this time usually 60min is required.
Fault	FAULTED	TDP is either not connected properly or requires maintenance. Loose cables or connectors can also cause a fault.
Err	MATH ERROR	Represents an overflow in the sap flow computation of thermocouple data.
Max	MAX FLOW	Maximum flow indicates that temperature rise is too low, less than 1 deg-C at high flow rates. Calculated flow is over the maximum usable sensor capability.
Off	OFF	TDP cable is OFF or is not connected. Also a bad connection in the heater wiring causes the off status

4.6 Charting Control

The charting area in white background displays flow readings in real time plotting all four gages in colors that match the bar graphs or average flow history when history plot is selected. The chart area is marked horizontal scale in time and vertical scale in flow rate in g/hr. Maximum flow rate is same as the maximum for the bar graphs and is shown on the top right corner of the charting area. The chart area is updated every scan interval. Click on the charting area to open Charting control dialog and set charting options. Arrows on the right of the charting area serve as scroll buttons. Use the left pointing arrow to move the data to the left, right pointing arrow to scroll the plot to the right. Use the '+' to zoom in the vertical axis scale an '-' zoom out the vertical axes and reset to reset vertical scale to 100 g/hr or 10mm.

Charting control dialog: Charting control dialog has the information about horizontal scale, vertical scale, and real-time/history plot.

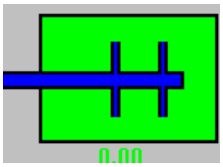


Vertical scale – Flow: Vertical scaling in grams/hour, for the bar graphs and flow plots for real-time and history flow rates.

Vertical scale – Depth: Vertical scale in mm depth, for water use in real-time and also for water use, rain, irrigation in history plot.

Horizontal Scale: Number of days to display on the history chart, has no effect on the real-time plot.

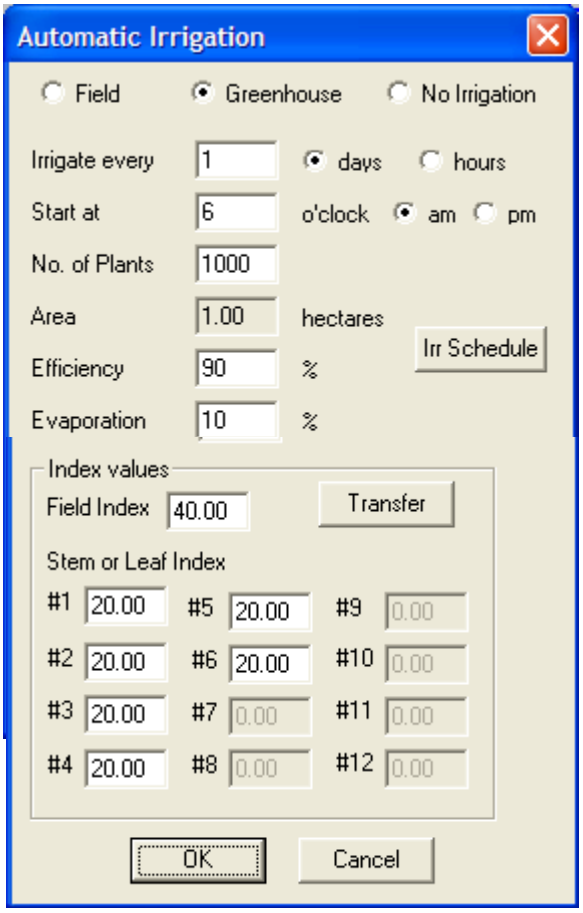
Plot Flow: Real-time plot or History plot would be displayed in the charting area by clicking on the corresponding radio button.



5.0 Irrigation Setup.....

Click on **"Irrigation" tab control >> automatic irrigation icon** to open automatic irrigation dialog box shown in fig. 13.12 and fig. 13.13. Select the type of irrigation, **Field or Green House or No Irrigation**. The dialog box changes according to the type of irrigation.

Field Irrigation: If selected type of irrigation is field,
enter **irrigation interval** in the box,
select days or hours by clicking on the appropriate radio button.
Enter the **irrigation start time** and click on the radio button **am or pm**.
Enter **plant density per hectare** as shown in fig. 13.13.
Edit **area of the field** in hectares.
Enter **efficiency**, **evaporation** percentages.



Green House Irrigation: If selected type of irrigation is green house,
enter **irrigation interval** in the box,
select **days or hours** by clicking on the appropriate radio button.
Enter the **irrigation start time** and click on the radio button **am or pm**.
Enter **number of plants** in the green house that is under test.
Area of the green house is set to 1hectare in green house mode.
Enter **efficiency, evaporation** percentages.

No Irrigation: Follow same procedure as that of Field irrigation. In this case there is no automatic irrigation. Only manual irrigation is possible in this setup.

Automatic Irrigation: For setting up automatic irrigation select Field or Green House from the Automatic irrigation dialog box and specify the irrigation interval and irrigation start time. Enter the field parameters and enter OK.

Manual Irrigation: For manual irrigation select No Irrigation option from the automatic irrigation dialog box. Enter the field parameters and click OK. This is also used for operating the FLOW4 in Data logger mode, i.e. Flow4-DL option.

5.1 Sap Flow Indexing

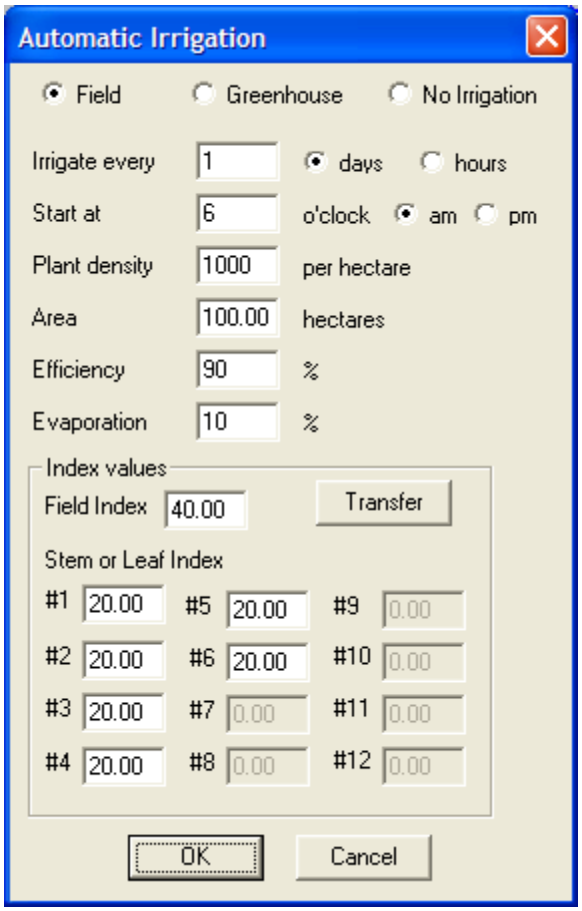
Stem/ Leaf Index and Field Index: Parameter: Stem or leaf area indexes are used to scale the average sap flow from the individual gauges to the entire field. Stem area index method uses the stem area/ sapwood area of each plant and average stem area/sapwood area of all plants in the crop. Leaf area index method uses LAI of individual plant and average LAI of all the plants in the crop.

Stem Area/ Sapwood area Index Method: Enter the stem area for the sample plants and enter in to the stem area in the stem gauge setup dialog box for all the gauges in operation. Then transfer this using Automatic Irrigation>Index Values> **Transfer button**. Transfer button will obtain the stem area from that specified in the TDP setup dialog and average them to obtain the average size plant. The average size plant is taken as Field Index. However the sample plants may be smaller or larger.

For Example, Stem Index #1: 20.0
Stem Index #2: 20.0
Stem Index #3: 20.0
Stem Index #4: 20.0
Field Index: 20.0

Alternatively to determine the average stem area randomly pick 20 to 50 plants measure their stem areas and average them. Enter this average value in to the field index.

For Example, Stem Index #1: 20.0
Stem Index #2: 20.0
Stem Index #3: 20.0
Stem Index #4: 20.0
Field Index: 40.0

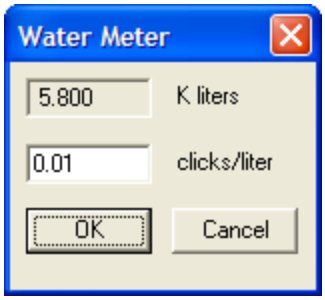


Leaf Area Index Method: An alternate and accurate method of scaling can be achieved by using the Leaf Area Index method. Determine the LAI of each sample plant and the average LAI of the crop by randomly choosing 20 to 50 plants
.

**** Refer to Flow4 6.0 User manual for a detailed discussion on Irrigation setup and control.**

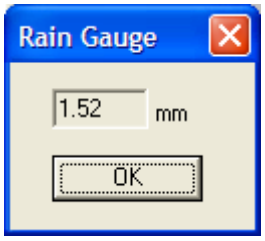
6.0 External Sensors Setup

Flow meter setup:



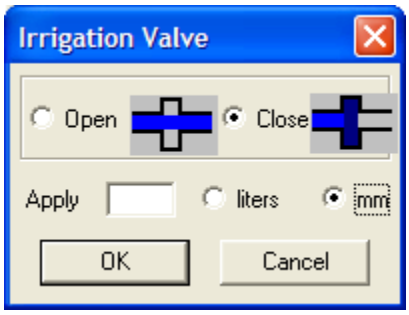
1) **Irrigation Tab control >> flow meter icon** to open the water meter dialog box shown below.
2) Determine k-factor for pipe and calculate clicks/liter
3) Enter the **clicks/liter**,
4) Click **OK**, confirm the changes by saying **YES** at the prompt.
5) The amount of water flow is shown in liters in the dialog box.

Rain gauge setup:



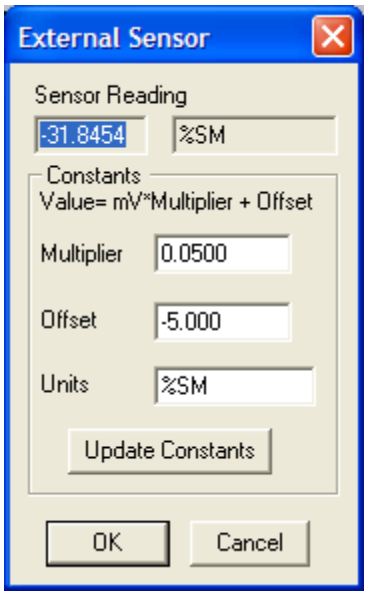
Follow hardware connections described earlier to connect rain gauge to external sensor cable of Flow4.
Irrigation Tab control >> Rain gage icon to display the rain gage dialog box. The amount of rainfall is displayed in mm of rain. No software setup is required for rain gauge.

Irrigation valve setup:



Irrigation Tab control >> **Irrigation valve icon** to open the Irrigation valve control dialog box shown in the fig. 10.10.
To irrigate manually a known amount of water to the field, enter number of **liters or mm of water** in the edit box. Click on radio button **OPEN**, which triggers the relay and open the irrigation valve. Once the required amount of water is pumped the valve closes automatically.

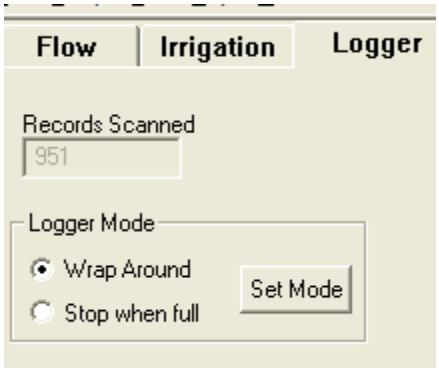
Auxiliary Sensor:



Irrigation Tab control >> Auxiliary sensor icon to open setup dialog box for the auxiliary sensor.
Enter multiplier, offset and units in which the auxiliary sensor parameter is calculated.
Examples, shown in the Table 10.2 are the constants for mineral soil. ,
Multiplier=0.05,
Offset=-5 and
Units = %SM
Click update constants to set the new parameters.
Click OK to close the dialog box.

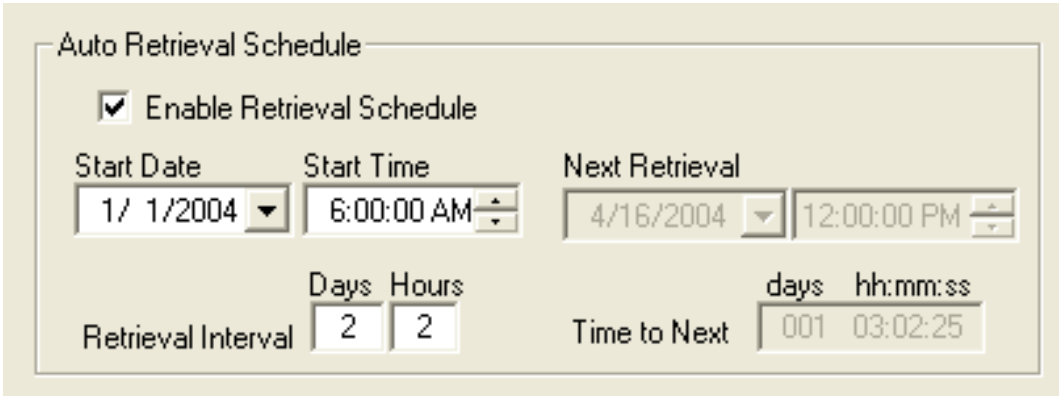
7.0 Logger Setup and Auto Retrieval Schedule

Logger Setup



Click on Logger Tab
Select **Append/ Over-write** Radio button
Click on **Set Mode** command button Set Mode

Setup Auto Retrieval Schedule



Follow the steps to setup Auto retrieval schedule,

Make sure Flow4 station is connected, if not got to
System Tab >> Station List >> Connect.
Select **Logger file name**;
Select Append/overwrite (It is recommended to use append)
Select **Flow History file name**;
Select append/overwrite (It is recommended to use append)
Select **Use History file name**;
Select append/overwrite (It is recommended to use append)
Select **Start Date/Time**
Enter **Retrieval Interval** (days, hours)
Enable the check box **Enable Retrieval schedule**

8.0 Solar panel power calculator

Solar panel power calculator is an Excel spread sheet application provided with the WinProbe software. Refer to the directory "C:\Dynamax\WinProbe\" and the application **SolCalTDP.xcl.** The calculator is based on Flow4 solar calculator. Format of the application is shown in the Table. 8.1, for 12 TDP30 sensors. The solar calculator application can be used to determine,

- number of solar panels required and power ratings of each solar panel
- number of external batteries required with power ratings of each,

For the application in hand by taking I

- number and type of TDP sensors heater voltage of each probe,
- number of Probe12 systems in use, as inputs for the calculation.
- number of radio modems powered by the solar panel

Solar Panel Calculations - Probe12 with Soil moisture sensor.

Sensor	Power Each Sensor Watts	Qty	Total W	Volts	Amps
TDP-10	0.12	0	0.00	2.0	0.00
TDP-30	0.20	12	2.40	3.0	0.80
TDP-50	0.32	0	0.00	5.0	0.00
TDP-80	0.50	0	0.00	7.5	0.00
TDP-100	0.44	0	0.00	8.0	0.00
System Power	1.20	1	1.20	6.0	0.10
Radio-MaxStream900	1.80	0	0.00	9.0	0.0
	Total	**13**	**3.6**		**0.90**

See insulation Chart

ESH Examples	
Canada	2.0 - 2.5
USA	3.5 - 5.0
India	7.0
Brazil	4.0
Africa	4.5 - 7.0
Australia	2.5 - 5.0
Spain	3.5

Sum all sensors	Total Amps	**0.90**Amp	
Safety Factor 20%	X1.2	1.08Amp	
24 Hr Consumption	X24 Hr	25.92AHrs	
Consumption w/ Power Down	X15 Hr	16.20AHrs	
Enter Equivalent Sun Hours (ESH)	5	5.18Array Current Required (24 H Oper.)	
Backup Battery	10	3.24Array Current Required (15 Hr Oper.)	
Battery Amperage	90	**Solar Panel Type Reqired - 24Hr**	5.18
		Quantity of Solar Panels Required	1.46
Quantity of 90 Ahr Batteries Needed	2.9	**Solar Panel Type Required - 15Hr**	3.24
Quantity of 90 Ahr Batteries Needed	1.8	**Quantity of Solar Panels Required**	0.9

Solar Panel Current Out	
MSX60	3.56
MSX40	2.37
MSX20	1.19
MSX10	0.59

Table 8.1 Solar Calculator

For Example, in the above application example shown in the spreadsheet uses,

- 1 Flow4 system
- 12 TDP30 with heater voltage 3.0 Volts

Hence requires, 1 MSX 53 solar panel and
2, 90Ahr external Battery

8.1 Wiring harness

Refer to the schematic solar panel external cable for connection between solar panel, external battery and Flow4

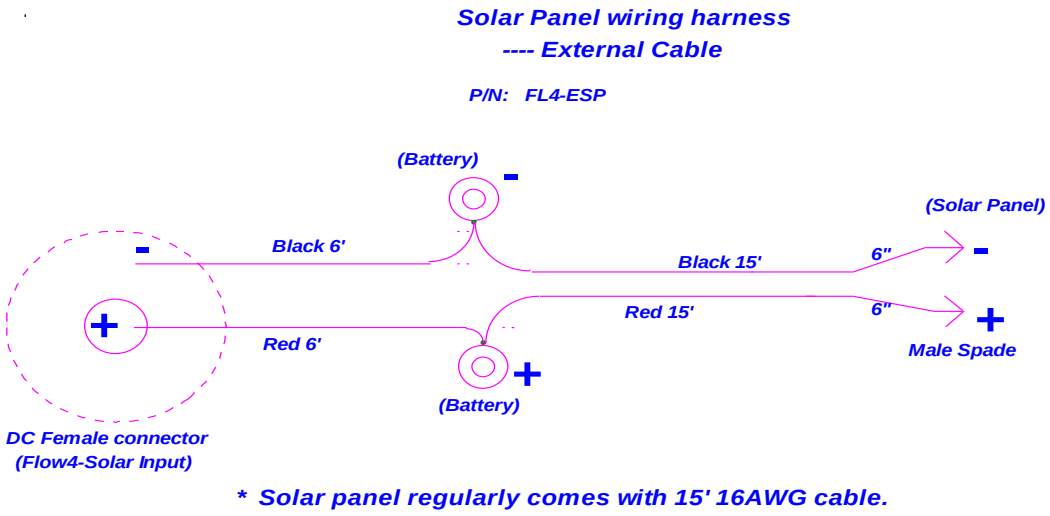


Figure 0.1 Solar panel - wiring harness